

**National Aeronautics and Space Administration
Ames Research Center
Moffett Field, CA 94035-0001**

DRAFT -- STATEMENT OF WORK -- DRAFT

SpE TASK ORDER 1

**RAPID RESPONSE SPACE WORKS (RRSW)
FACILITY OPERATION AND MISSION READINESS**

RFP# NNA17608320R

Period of Performance: Contract Award – End

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TABLE OF CONTENTS

1	Scope	4
1.1	Objective	4
2	Applicable Documents.....	4
3	Requirements	4
3.1	Systems Engineering & Integration (SE&I).....	4
3.2	Operations	5
3.3	Integrated Logistics Support (ILS).....	6
3.4	Assembly, Integration, and Test (AI&T)	7
3.5	Space Vehicle and Ground System Design and Procurement.....	7
3.6	Facilities	7
3.7	Procurement	8
3.8	Launch Services	7
4	Programmatic Tasks	8
4.1	Phase-In / Phase-Out	8
4.2	Kick-Off Meeting.....	9
4.3	Technical Interchange Meetings	9
4.4	Cost Performance	8
4.5	Contractor Integrated Performance Management	9
4.6	Integrated Master Schedule (IMS)	9
4.7	Integrated Baseline Reviews (IBRs)	9
4.8	Risk Management.....	9
4.9	Quality Assurance	9
4.10	Work Breakdown Structure (WBS)	9
4.11	Security Program.....	10
4.12	Training Program	10
4.13	Information Assurance	9
5	Deliverables	9

1 Scope

This Task Order Statement of Work (SOW) serves as an anchor task to define work that the Contractor will perform in support of missions and capability enhancements for the Operationally Response Space (ORS) Office at Kirtland AFB, at Albuquerque, NM. Inclusive of project and management responsibilities, the Contractor will operate ORS' facilities at Kirtland including the Rapid Response Space Works (RRSW) Facility. Requirements will include managing the infrastructure to support end-to-end mission coordination, limited design, procurement, assembly, integration, test, and support for on-orbit, launch, and ground system operations.

Period of Performance: Contract Award through Contract Completion (5 years)

1.1 Objective

The objective of this Task Order is to implement the processes to operate the RRSW Facility, and augment ORS capabilities to enable full mission execution. This includes, with tightly coupled interaction with the ORS team and its stakeholders, creating and controlling the standards and interfaces necessary to provide a rapid response capability. The capabilities cover a broad range of small non-human flight missions, to include CubeSats, Space Vehicles, Space Solutions Architecture variations, as well as rapid payload integration on various Bus options.

2 Applicable Documents

The Contractor shall comply with current NASA Procedural Requirements (NPR) and other applicable NASA and DOD requirements. A listing of these documents is located in Section J.1 (a), Attachment 12 of the Contract.

3 Requirements

The Contractor shall provide the requisite operational expertise, engineering, technical, program management, and administrative services to execute the following requirements. Services will primarily be conducted at Kirtland AFB, and other Government locations, and/or other contractors' facilities depending on specific mission needs.

3.1 Systems Engineering and Integration (SE&I)

The Contractor will provide SE&I services to continually support the management of the systems that comprise the inherent ORS capabilities from a functional standpoint. Refer to SSPEDI J.1 (a) Attachment 12 for a description of these capabilities. This will include assessments and engineering analysis to determine ways to continually improve these capabilities. The Contractor shall thus:

- 3.1.1 Continually develop and maintain the RRSW capability and assets therein using a time-phased approach (processes, facilities, tools, etc.) to ensure operational readiness.
- 3.1.2 Identify, assess and report on potential trades used in developing mission approaches, describing technical/engineering options that were considered, and how the impact of those could impact on technical performance, program risk, cost, and schedule.

- 3.1.3 Identify, assess, and promote design corrective actions by identifying potential failure risks in order that appropriate corrective actions may be taken early to eliminate or control high risk items to improve operational readiness and reduce life cycle costs, for major interface level and for critical path items.
- 3.1.4 Document and provide status on failures that have occurred during manufacture, assembly and integration and testing, as part of the overall management program to detect, isolate and correct component failures.
- 3.1.5 During the mission design phase, conduct technical reviews of components, subsystems and assemblies provided by others and provide documentation as required.
- 3.1.6 Develop and maintain a configuration control system for the ORS capability including: architecture and system descriptions, standard operating procedures, mission procedures, RRSW level processes, interface control documents, assembly drawings, software, mission parameters, models, simulation, analyses results, and databases relating to performance and other testing results of each system processed through the RRSW.
- 3.1.7 Develop and perform space vehicle design analyses capabilities including:
 - Structural, dynamic (sine, random vibration, shock), and thermal analyses (on-orbit, balance, and cycling)
 - Preliminary and final design models and drawings and Interface Control Documents (ICDs) using Computer Aided Design (CAD) and Computer Aided Machining (CAM)
 - Power and data throughput analyses
 - Launch vehicle interface design and analyses, including interface attenuation design

3.2 Operations

- 3.2.1 Document the mission plans in a Concept of Operations (CONOPS) document, in coordination with ORS management and submit for Government approval.
- 3.2.2 Define and develop end-to-end mission operations procedures from notification to early on-orbit operations. Conduct and validate end-to-end mission operations as part of dry run exercises to demonstrate these capabilities.
- 3.2.3 Support the development and implementation of the RRSW Mission Assurance Plan.
- 3.2.4 Conduct mission planning and analysis in response to launch-on-schedule and launch-on-demand operational needs. Support planning and conduct validation exercises for launch-on-schedule and launch-on-demand operations.
- 3.2.5 Support development of an operational training capability. Develop the RRSW operations transition and training plans, training manuals and materials. Identify any long lead items to support nominal RRSW operations and user operations training.
- 3.2.6 Provide documentation on mission, safety, and environmental operations in support of end-to-end mission operations.
- 3.2.7 Establish RRSW process, procedure, and test scripting development and end-to-end operation validation, including:
 - Software in the Loop (SIL) – Support scripting and flight software development

- Processor in the Loop (PIL) – Support integration of models, simulations, and flight software with a flight (or flight like) processor system
 - Hardware in the Loop (HIL) – Support complete space vehicle system hardware suite functionality integrated with flight software, environmental models, and interfaces to flight GSE – Support complete system functional checkout and operator training
- 3.2.8 Support RRSW Launch activities that may include Space Vehicles and CubeSat enabler missions involving all activities through an end-to-end response including, assembly, integration and test, preparation for launch vehicle integration, and on-orbit operation.
- 3.2.9 Support Joint Operational Demonstrations for the Government including coordination and integration with key external interfaces (Ground, Launch, Downlink Communication).
- 3.2.10 Identify and procure required hardware and software in support of Capability Demonstrations and Joint Operational Demonstrations, with approval from the Government for procurements over \$10K.
- 3.2.11 Develop plans, processes, and procedures to transition RRSW early orbit operations to the end user. Conduct training exercises with Government designated users as part of the RRSW Capability Demonstrations.

3.3 Integrated Logistics Support (ILS)

- 3.3.1 Provide an annual report to the Government on inventory of Government-furnished and contractor-acquired material and non-expendable special tooling (including vendor tools); special test equipment; and all accessories and attachments; on both a quantitative and monetary basis segregated by categories of property.
- 3.3.2 Conduct a supportability analysis to determine required sustainment functions, such as repair, spares, inventory management, required to ensure parts availability to meet production schedules, and report as required. Develop an Integrated Logistics Support Plan that encompasses all products (procured or developed) incorporated into RRSW operations. The plan shall be submitted for Government approval as part of the Phase-In activity and updated as needed.

3.4 Assembly, Integration, and Test (AI&T)

- 3.4.1 The Contractor shall verify mission requirements in accordance with the system specification. Develop a Test Plan that details all tests required to verify system and subsystem function and performance and provide test procedures and test report results for all performance, environmental, system/subsystem, integration, acceptance, and end-to-end tests.
- 3.4.2 Define and develop AI&T procedures that support a responsive space end-to-end mission integration. Procedure development should include demonstrations for validation. The Contractor shall provide capability for component and subsystem testing and complete payload and bus testing. The Contractor shall establish software, processor, and hardware development cells (software, processor and hardware in the loop) developing the core AI&T processes and procedures. Provide capability for core space vehicle testing including: thermal vacuum testing (balance and cycling), dynamic load testing

(shock and random vibration), and mass properties testing (mass, center of gravity and moments of inertia).

3.5 Space Vehicle and Ground System Enterprise (GSE) Design and Procurement

- 3.5.1 The Contractor shall define RRSW GSE requirements and work with the ORS Office to develop the RRSW GSE design baseline. The Contractor shall identify and procure all required GSE hardware and software, with Government concurrence on procurements over \$10K. The GSE operation shall be validated within the RRSW Capability Demonstrations and Joint Operational Demonstrations.
- 3.5.2 Identify, procure, install, and checkout facility equipment (e.g., unique handling equipment, unique storage capability) necessary to operate the Facility.

3.6 Facilities

- 3.6.1 Develop and maintain a Facility Operations Plan that is periodically reviewed and updated. Plan and schedule facility operations, and safety and maintenance operations (both routine and ad-hoc to contend with critical and/or unforeseen maintenance needs).
- 3.6.2 Manage day-to-day operations of Government-provided facilities in a state of functional readiness, unless directed to transition a particular facility to an inactive or stand down mode.

3.7 Procurement

- 3.7.1 The Contractor shall procure hardware, software and tools required for the rapid response operations activities in the RRSW facility, which support mission planning, mission simulation, and AI&T functions.
- 3.7.2 The Contractor shall procure and support the acquisition of spacecraft payloads, buses, subsystems, software, components, and/or ground systems, which may require integrated logistics and procurement support including material planning and control, inventory management, acquisition, shipping and receiving.
- 3.7.3 The Contractor shall procure launch services as required to low earth orbit, higher earth orbits and/or other destinations as a primary, secondary, or hosted payload configuration.
- 3.7.4 For items with an actual, total, and initial cost of \$10,000 or less, no further approval by the Government will be required prior to procurement. For items with an actual, total, and initial cost greater than \$10,000, Government approval is required prior to procuring the items as the Government may require additional justification to include cost analysis and/or trade studies.

3.8 Launch Services

The contractor shall be responsible for the coordination and acquisition of launch services in support of ORS missions. The following tasks shall be executed in the support of low-cost access to space for small spacecraft using commercial launch and communication services.

- 3.8.1 Procure commercial launch services for secondary, primary, and rideshare payloads. These end-to-end launch services include: small satellite separation systems and dispensers, mission management, modal testing, mission assurance, payload integration and launch brokerage, launch, and hosting to secondary payload customers.
- 3.8.2 Procure commercial satellite communication services, including analysis, space-to-ground communications, command and control, and data routing.
- 3.8.3 Develop Interface Control Document (ICD) between spacecraft and launch vehicle.
- 3.8.4 Develop documentation required by the launch provider in accordance with Federal regulations, internal policy, and launch range requirements.
- 3.8.5 Provide coordination with Range Safety.
- 3.8.6 Support post-flight analysis to verify successful separation from the launch vehicle.

4 Programmatic Tasks

4.1 Phase-In/Phase-Out

- 4.1.1 Phase-In: The phase-in process shall be accomplished as expeditiously as possible, with a maximum phase-in period of 60 days. The phase-in process shall not adversely impact the work being done by the outgoing contractor. It shall be conducted in a manner consistent with safe operation requirements. The incoming contractor is responsible for providing a qualified contractor staff by the end of the phase-in period.
- 4.1.2 Phase-Out: Upon completion of this contract, the outgoing contractor is responsible for the orderly transfer of duties and records to the incoming contractor. This should be accomplished in an expeditious manner, consistent with any contract phase-in schedule, while minimally impacting ongoing task orders. The contractor shall submit a phase-out plan no later than 60 days before the end of the contract for Government review and approval.

4.2 Kick-Off Meeting

The Contractor shall host a Kick-Off Meeting to review and introduce its organization, management and technical processes, program plan and schedule, and cost, schedule, technical, requirements and risk assessments.

4.3 Technical Interchange Meetings (TIMs)

The Contractor will support Technical Interchange Meetings with the Government, potential bus, payload and/or satellite vehicle developers, and potential ground segment providers, as needed, to identify, resolve, and establish architecture, technical interface, assembly and integration activities.

4.4 Cost Performance

The contractor shall establish a program cost baseline to measure cost progress. The contractor shall provide monthly cost and performance reviews.

4.5 Contractor Integrated Performance Management

The contractor shall establish, maintain, and use an integrated performance management system in the performance of this task to provide for early indication of cost and schedule problems, and their relation to technical achievement.

4.6 Integrated Master Schedule (IMS)

The contractor shall develop and maintain an Integrated Master Schedule (IMS) by logically networking detailed program activities, to be delivered to the Government monthly.

4.7 Integrated Baseline Reviews (IBRs)

The contractor will participate in Integrated Baseline Reviews (IBRs) to evaluate the risks inherent in the contract's planned performance measurement baseline.

4.8 Risk Management

The contractor shall identify program risks and individual mitigation plans to retire risks as defined in a Risk Management Plan. The contractor shall assess program risks on an ongoing basis and evaluate risk mitigation progress monthly.

4.9 Quality Assurance

The contractor shall develop and accomplish quality assurance in accordance with DoD applicable documents.

4.10 Work Breakdown Structure (WBS)

The contractor shall develop and maintain a contract WBS to be delivered 60 days after award, and then update as required.

4.11 Security Program

Establish and implement a security program in accordance with applicable U.S. Government guidelines.

4.12 Training Program

Oversee training programs to maintain proficiency and assurance for ORS missions.

4.13 Information Assurance

The Contractor shall comply with applicable Government guidelines for Information Assurance as directed by the ORS Office.

5 Deliverables

The Contractor shall prepare and maintain program, design, test, and other relevant documentation in accordance with its program plans and the following data requirements list contained in Section J.1 (a) Attachment 3 of the Contract.